CLAIMS

1. A multidirectional input device comprising:

(a) a ring-shaped resistance element layer formed on an insulating substrate;

(b) a conductive section disposed on a plane substrate which is spaced from said resistance element layer at a given insulating space; and

(c)an operating section for bringing said resistance element layer into contact with said conductive section partially,

wherein a voltage is applied to said resistance element layer,

wherein one of the insulating substrate and the plane substrate is pressed using said operating section, so that said resistance element layer comes in contact with said conductive section partially,

wherein a contacted position between said resistance element layer and said conductive section is detected using a signal supplied from said conductive section.

2. The multidirectional input device of claim 1,

wherein the insulating substrate is a flexible insulating substrate,

wherein said ring-shaped resistance element layer is formed on a lower surface of the flexible insulating substrate, and has a plurality of electrodes at given positions,

wherein said conductive section is formed of a first conductive layer and a second conductive layer insulated each other,

wherein said operating section has a ring-shaped protruded section and a knob, and the protruded section is spaced from an upper surface of the flexible insulating substrate at a given distance, and the knob is held to be able to tilt in

an arbitrary direction with respect to a center of a lower surface of said operating section,

wherein a voltage is applied to the plurality of electrodes,

wherein when the knob tilts, the protruded section bends a part of the flexible insulating substrate, so that said resistance element layer comes in contact with one of the first conductive layer and the second conductive layer for conduction,

wherein output voltages supplied from respective leads of the first conductive layer and the second conductive layer are calculated, so that a tilt direction of knob is recognized.

3. The multidirectional input device of claim 2,

wherein said ring-shaped resistance element layer has an uniform resistivity, and a ring-width of the layer is uniform,

wherein the respective plurality of electrodes are placed at an equiangular interval from a center of said ring-shaped resistance element layer,

wherein the first conductive layer and the second conductive layer are insulated by insulating sections corresponding to the plurality of electrodes.

4. The multidirectional input device of claim 2 further comprising:

a conductive plate made of anisotropic conductor disposed between said ring-shaped resistance element layer and both of the first conductive layer and the second conductive layer,

wherein when the anisotropic conductor is pressed thicknesswise, a pressed position of the anisotropic conductor conducts thicknesswise.

5. The multidirectional input device of claim 2 further comprising:

a push switching section formed of a switch contact and a push switch,

wherein the switch contact is formed of a fixed contact and a resilient domed moving contact, and the fixed contact is formed of a central contact and an outer contact which is formed around the central contact, and the moving contact insulated is disposed on a center of said resistance element layer of the flexible insulating substrate, and a lower circumference section of the moving contact is disposed on the outer contact,

wherein the push switch is held by a through-hole punched at a center of the knob, and can move up and down independently of the knob, so that an upward moving of the push switch is restricted, and a center of a lower surface of the push switch comes in contact with an upper section of the moving contact,

wherein the first conductive layer and the second conductive layer shape in arcs having given widths.

6. The multidirectional input device of claim 5,

wherein a section to be pressed of an upper surface of the knob is formed inside a ring-shaped protruded section beneath the knob,

wherein the push switch is held concentrically in the through-hole of a center of the knob,

wherein when the section to be pressed of an upper surface of the knob is pushed and the knob is tilted to a desirable direction, the knob pushes the flexible insulating substrate and the direction of the tilted knob is recognized, then the push switch pushes the domed moving contact.

7. The multidirectional input device of claim 1,

wherein the plane substrate is made of conductive metal substrate functioning as said conductive section,

wherein a number of the plurality of electrodes are not less than three,

wherein two of the plurality of electrodes are selected sequentially, and a voltage is applied to the selected two of the plurality of electrodes.

8. The multidirectional input device of claim 7,

wherein the plane substrate is formed of the conductive metal substrate incorporating an output terminal, and the output terminal is routed to outside, and the plane substrate is fixed to a casing,

wherein a conductive resilient leg fixed to the casing comes resiliently in contact with a terminal of said resistance element layer,

wherein when said resistance element layer partially comes in contact with the plane substrate by operating said operating section, a voltage is applied alternately to input terminals of the casing corresponding to the resilient legs, so that the voltage is applied to said resistance element layer, and a signal is thus obtained from the output terminal.

9. The multidirectional input device of claim 7,

wherein, the insulating substrate has input terminals of a plurality of electrodes, and the input terminals are routed to outside, and the insulating substrate is fixed to the casing,

wherein the plane substrate is formed of a resilient metal substrate incorporating an output terminal,

wherein when said resistance element layer comes in contact with the plane substrate partially by operating said operating section, a voltage is applied alternately to input terminals of the casing, so that the voltage is applied to said resistance element layer, and a signal is thus obtained from the output terminal.

10. The multidirectional input device of claim 8 further comprising a switch,

wherein the insulating substrate has an aperture corresponding to a center of said resistance element layer,

wherein said switch corresponding to the aperture is disposed at a place on the plane substrate,

wherein said operating section operates said switch through the aperture.

11. The multidirectional input device of claim 9 further comprising a switch at a center of said resistance element layer of the insulating substrate.

12. An electronic apparatus comprising:

(a) a top casing having a through-hole, and used as covering-material of said electronic apparatus; and

(b) a multidirectional input device including:

(b-1) a ring-shaped resistance element layer formed on an flexible insulating substrate;

(b-2) a conductive section disposed on a plane substrate which is spaced from said resistance element layer at a given insulating space; and

(b-3) an operating section for bringing said resistance element layer into contact with said conductive section partially,

wherein a contacted position between said resistance element layer and said conductive section is detected using a signal supplied from said conductive section.

13. The electronic apparatus of claim 12,

wherein the insulating substrate is a flexible insulating substrate,

wherein said ring-shaped resistance element layer is formed on a lower surface of the flexible insulating substrate, and has a plurality of electrodes at given positions,

wherein said conductive section is formed of a first conductive layer and a second conductive layer insulated each other,

wherein said operating section has a ring-shaped protruded section and a knob, and the protruded section is spaced from an upper surface of the flexible insulating substrate at a given distance, and the knob is held to be able to tilt in an arbitrary direction with respect to a center of a lower surface of said operating section,

wherein a voltage is applied to the plurality of electrodes,

wherein when the knob tilts, the protruded section bends a part of the flexible insulating substrate, so that said resistance element layer comes in contact with one of the first conductive layer and the second conductive layer for conduction.

14. The electronic apparatus of claim 13,

wherein the plane substrate is a plane printed circuit substrate of said electronic apparatus,

wherein an upper surface of the knob is exposed from the through-hole of said top casing.

15. The electronic apparatus of claim 14,

wherein the flexible insulating substrate is a flexible printed circuit substrate disposed above the plane printed circuit substrate.

16. The electronic apparatus of claim 14 further comprising:

a resilient body placed between a lower surface of a section formed around the through-hole of said top casing and a flange–preventing the knob from coming off–formed of a circumference of the knob,

wherein the knob is held substantially vertical to the plane substrate steady.

17. The electronic apparatus of claim 13,

wherein said multidirectional input device further comprises a push switching section formed of a switch contact and a push switch,

wherein the switch contact is formed of a fixed contact and a resilient domed moving contact, and the fixed contact is formed of a central contact and an outer contact which is formed around the central contact, and the moving contact insulated is disposed on a center of said resistance element layer of the flexible insulating substrate, and a lower circumference section of the moving contact is disposed on the outer contact,

wherein the push switch is held by the through-hole punched at a center of the knob, and can move up and down independently of the knob, so that an upward moving of the push switch is restricted, and a center of a lower surface of the push switch comes in contact with an upper section of the moving contact,

wherein the first conductive layer and the second conductive layer shape in arcs having given widths,

wherein the plane substrate is a plane printed circuit substrate of said electronic apparatus, and formed of the first conductive layer, the second conductive layer and the fixed contact of the switch contact,

wherein the flexible insulating substrate placed above the printed circuit substrate further comprises the moving contact of the switch contact,

wherein the knob is exposed from the through-hole of said top casing,

wherein the push switch is held in the through-hole of a center of the knob.

18. The electronic apparatus of claim 12,

wherein said operating section can tilt and slide, and said resistance element layer partially comes in contact with said conductive section by one of tilting said operating section and sliding said operating section, so that an operating direction is detected by the signal.

19. The electronic apparatus of claim 18,

wherein when said resistance element layer partially comes in contact with said conductive section by operating said operating section, a moving speed of one of a cursor and an icon along a direction corresponding to the contacted point is controlled such that the moving speed can change responsive to a result detected within a given time.

20. The electronic apparatus of claim 19,

wherein one of when the signal from a substantially identical contacted point, at which said resistance element layer partially comes in contact with said conductive section, is detected two times sequentially and when the signal is detected continuously for more than a given time, a moving speed of one of a cursor and an icon along a direction corresponding to the contacted point is controlled such that the moving speed can change.

21. The electronic apparatus of claim 12,

wherein said multidirectional input device further comprises a switch at a center of said resistance element layer of the insulating substrate,

wherein the plane substrate is formed of the conductive metal substrate incorporating an output terminal, and the output terminal is routed to outside, and the plane substrate is fixed to the casing,

wherein a conductive resilient leg fixed to the casing comes resiliently in contact with a terminal of said resistance element layer,

wherein the insulating substrate has an aperture corresponding to a center of said resistance element layer,

wherein a switch corresponding to the aperture is disposed at a place on the plane substrate,

wherein a number of the plurality of electrodes is not less than three,

wherein said operating section can tilt, slide and move downward, so that said resistance element layer partially comes in contact with the plane substrate by one of tilting said operating section and sliding said operating section, and a voltage is applied alternately to input terminals of the casing corresponding to the resilient legs, the voltage is thus applied to said resistance element layer,

wherein an operating direction is detected by the signal, so that one of a cursor and an icon moves, then a predetermined item is selected using a switch signal from the switch obtained by pushing said operating section.

22. The electronic apparatus of claim 21,

wherein said multidirectional input device further comprises a switch at a center of said resistance element layer of the insulating substrate.